REMARKS

1. Summary of Office Action

In the Office Action dated May 5, 2004, the Examiner stated that claims 1-10 were pending and that the drawings were accepted. Applicant has canceled claim 2 and has amended claims 1, 3, and 7. No new matter has been added. Now pending are claims 1 and 3-10.

Of the claims the Examiner (1) indicated the allowability of claim 10; (2) rejected claims 1, 2, and 7 under 35 U.S.C. § 102(b) as being anticipated by Gnepf et al, U.S. Patent 6,009,629 ("Gnepf"), and under 35 U.S.C. § 102(a) and (e) as being anticipated by Smith, U.S. Patent 6,539,639 ("Smith"); and (3) objected to claims 3-6, 8, and 9 as being dependent upon rejected base claims.

Applicant submits that claims 1 as amended is now currently in condition for allowance, and that claim 7 is directed to allowable subject matter. Therefore, Applicant requests that claims 3-6, which are dependent on claim 1, and claims 8 and 9, which are dependent on claim 7 also be allowed.

After careful review of the pending claims and the cited references, Applicant respectively requests reconsideration in view of the following remarks.

2. Response to 35 U.S.C. § 102(b) Rejection

Claims 1, 2, and 7 were rejected under 35 U.S.C. § 102(b) as being anticipated by Gnepf. Claim 2 has been canceled. Accordingly, the rejection of claim 2 is moot. Claim 1 has been amended to clarify that the compass system comprises a "2-axis magnetic sensor". Claim 7 has not been altered.

Applicant describes in amended claim 1 a compass system that utilizes a "2-axis magnetic sensor" and specifically notes a "magnetic field component, *Z*," that denotes a third axis in three-dimensional space "that is orthogonal to the 2-axis magnetic sensor measurement axes" and is calculated "using inputs from the 2-axis magnetic sensor and using at least one stored value for the Earth's magnetic field strength." It is noted that the calculation exploits the fact that the magnitude of the Earth's magnetic field remains relatively constant in localized geographical areas (background, page 2, lines 15-17). Likewise, Applicant in claim 7 describes a tilt compensation method for the compass system recited above. Therefore, the direction of the Earth's magnetic field can be mathematically calculated by using information from as few as two independent axes, which "allows for the elimination of the third sensor, so a very flat, compact sensor package that is relatively insensitive to tilt can be made." (detailed description, page 9, lines 12-14).

Gnepf teaches a method that utilizes a magnetic compass with "three magnetic field sensors" that determine "three magnetic field components which need not necessarily be mutually orthogonal." (Gnepf, column 3, lines 47-50). Smith also teaches that a minimum of 12 linearly independent equations are necessary to solve for all unknowns including those of a soft magnetic distortion matrix (Gnepf, column 5, lines 30-35). Therefore, although the field axes do not need to be mutually orthogonal, a 2-axis system can not be created by defining the orientation of the above magnetic field components as two independent axes and one similar axis, which would result in a linear dependence and a reduction of the vector dimension space to a degree that is unsolvable by the method proposed by Gnepf. As a result, Gnepf requires a magnetic compass that must measure three independent axes for correct operation, and minimally requires the use of three magnetic sensors in a 3-axis configuration where all axes are independent.

Gnepf only teaches the use of two orthogonally (2-axis) mounted encoders, not magnetic field

sensors, as a method for determining rotation and tilt information and shows that these must be referenced to a separate magnetic compass mounting, indicating a different group of sensors (Gnepf, column 7, lines 33-40). Gnepf further defines the function of encoders as being used as "devices for measuring inclination" (Gnepf, column 8, lines 63-66) and not as magnetic field measurement sensors.

Applicant submits that because claims 1 and 7 describe a 2-axis magnetic sensor combined with a mathematical method to calculate magnetic vectors in three dimensions, while Gnepf teaches a 3-axis magnetic sensor to directly measure three-valued magnetic vectors, and because there is substantial difference between the calculation of a value and direct measurement using electronic equipment, evidence of novelty for the claims is shown in this case.

In light of the above remarks, Applicant respectfully requests withdrawal of the 35 U.S.C. § 102(b) rejection.

3. Response to 35 U.S.C. § 102(a) and (e) Rejection

Claims 1,2 and 7 were rejected under 35 U.S.C. § 102(a) and (e) as being anticipated by Smith. Claim 2 has been canceled. Accordingly, the rejection of claim 2 is moot. As stated above, claims 1 and 7 are directed to a compass system comprising "a 2-axis magnetic sensor" and a "method for compensating for tilt in an electronic compass having a 2-axis magnetic sensor". Utilizing a 2-axis magnetic field sensor rather than a 3-axis magnetic field sensor allows for simplification of equipment (detailed description, page 7, lines 9-16).

Smith teaches several methods of monitoring the accuracy of an electronic compass and only recites methods for determining the direction of the Earth's magnetic field as references to describe

his inventions. When describing processes to determine the direction of the Earth's magnetic field Smith consistently cites the use of a three-axis magnetometer, which is generally fixed (Smith, column 3, lines 35-38, and column 5, lines 56-60). In addition, measured field vectors are consistently referred to as "field measurements with respect to each of the three axes" (Smith, column 6, lines 38-40) or a "three-axis magnetic field vector" (Smith, column 8, lines 16-18) or in a similar manner indicating that the field vector consists of measurements in three dimensions. Smith only refers to horizontal and vertical values separately as vectors defining a single plane where these values are compensated magnetic field components that have been calculated through rotational matrices or other transformations acting on three-dimensional measured vectors. Smith does not teach a method for deriving a three-axis value of the Earth's magnetic field from a two-axis magnetic sensor.

Because claims 1 and 7 specifically recite the use of "a 2-axis magnetic sensor", and because only three-axis magnetic field sensors are considered by Smith, Smith can not anticipate Applicant's claims 1 and 7, as well as claims 3-6,8, and 9, which ultimately depend from claims 1 and 7.

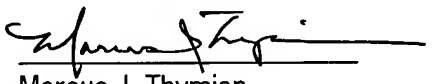
In light of the above remarks, Applicant respectfully requests withdrawal of the 35 U.S.C. § 102(a) and (e) rejections.

CONCLUSION

In light of the above amendments and remarks, Applicant submits that the present application is in condition for allowance and respectfully requests notice to that effect. The Examiner is requested to contact Applicant's representative below at (312) 935-2352 if any questions arise or he may be of assistance to the Examiner.

Respectfully Submitted,

Date: Aug. 4, 2004

By: 

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